

Population-based information as a catalyst for reform of the health care delivery system

Presentation by John Wennberg and Jon Skinner

The Green Mountain Care Board

Wednesday, January 31, 2018



**Lyndon Baines Johnson (President, 1963-69)
signing the Medicare legislation**

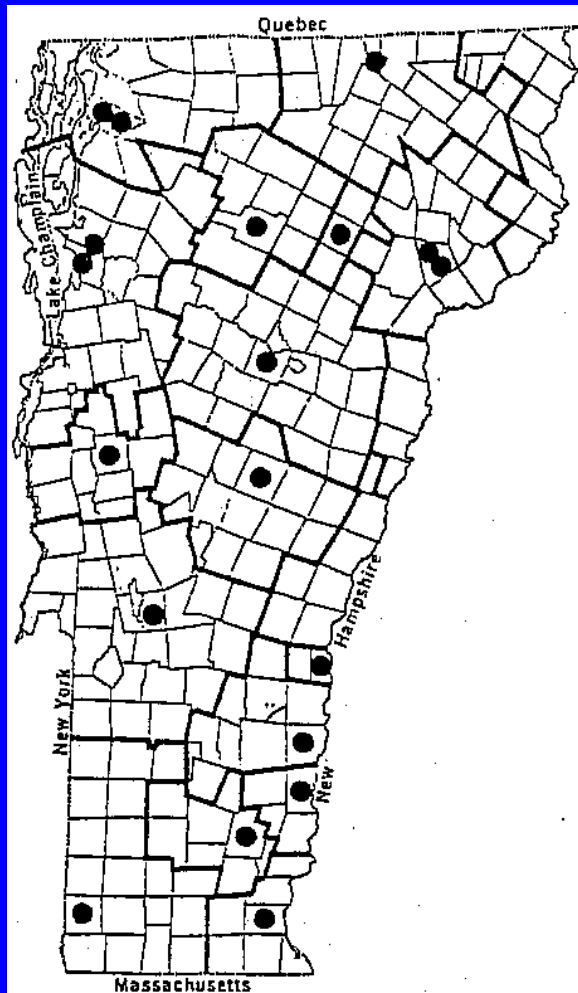


Fig. 1. Map of Vermont showing minor civil divisions, the Vermont town (lighter line). Darker line shows boundaries of hospital service areas. Circles represent hospitals. Areas without circles are served principally by hospitals in New Hampshire.

Small Area Variations in Health Care Delivery

A population-based health information system can
guide planning and regulatory decision-making.

John Wennberg and Alan Gittelsohn

Science, 14 Dec 1973

Variation in Resource Inputs: Facilities and Manpower - Vermont, 1969

| | Lowest areas | Highest areas | Ratio |
|--|---------------------|----------------------|--------------|
| Beds per 10,000 persons | | | |
| Hospitals | 34 | 59 | 1.7 |
| Nursing homes | 9 | 65 | 7.2 |
| Personnel per 10,000 persons | | | |
| Hospitals | 68 | 128 | 1.9 |
| Nursing homes | 8 | 52 | 6.5 |
| FTE physicians per 10,000 persons | 7.9 | 12.4 | 1.6 |
| General practice | 1.5 | 4.4 | 2.9 |
| Internal medicine | .9 | 2.6 | 2.9 |
| Pediatrics | .1 | 1.2 | 12.0 |
| Obstetrics | .1 | 1.1 | 11.0 |
| General surgery | .7 | 1.7 | 2.4 |

Variation in Utilization: Vermont, 1969

| | Lowest areas | Highest areas | Ratio |
|---|-------------------------|--------------------------|--------------|
| Utilization rates per 10,000 persons | | | |
| Hospital days | 1015 | 1495 | 1.5 |
| Hospital discharges | 122 | 197 | 1.6 |
| All surgical procedures | 36 | 69 | 1.9 |
| Respiratory disease | 10 | 36 | 3.6 |
| Genitourinary disease | 8 | 18 | 2.3 |
| Circulatory disease | 12 | 25 | 2.1 |
| Digestive disease | 15 | 26 | 1.7 |
| Nursing Home admissions, age 65 and over | 14 | 81 | 5.8 |
| Expenditures per capita \$ | | | |
| Hospitals | 58 | 120 | 2.1 |
| Nursing homes | 5 | 26 | 5.2 |
| Medicare Part B, age 65 and over | 54 | 162 | 3.0 |

The RMP's Coronary Care Project to promote regionalization

The Northern New England Regional Medical program made a significant investment in coronary care improvement activities in Vermont. These activities include network planning, the establishment of criteria and guidelines for planning and operation of units and of treatment protocols, and a data system for evaluating the capacity, utilization and outcomes of care.

A coronary care regional management committee was established to manage these activities and was responsible for the network and making evidence-based recommendations for investing RMP resources.

Does Hospital B need more coronary care beds?

In 1971, Hospital B sought funds from RMP to expand its coronary care unit because of a high occupancy rate. In reaching their decision, the management committee used population-based data profiling utilization and resource use among the network hospitals. As it turned out, Hospital B was the most inefficient unit in the network.

Based on its relative ranking in capacity and utilization, the Committee recommended against the proposal.

Does Hospital E need a neurosurgical service?

In 1971, Hospital E, the sole community hospital in a service area of about 60,000, was locked in debate concerning whether to build a neurosurgical service. A request was made to the RMP for information on the distribution of neurosurgeons throughout the region. The RMP prepared a report for Hospital E that addressed 2 questions:

Are there enough neurosurgical cases in the population to support a unit?

What will be the impact of the Vermont region if Vermont hospitals of similar size as Hospital E were to establish neurosurgical units?

Is there enough neurosurgical cases in the population served by Hospital E to support a unit?

Analysis of Vermont's all payer database indicated that the case load of neurosurgical procedures in Hospital B's service area would not support a neurosurgical service. The incidence of cases that uniformly are the responsibility of neurosurgeons would support only 40% of the workload of a single physician.

What will be the impact of the Vermont region if Hospital E (and others of similar size) establish neurosurgical units?

If all Vermont hospitals with a similarly sized population acquired a neurosurgeon, there would be a significant impact on the ecology of Vermont's health care system.

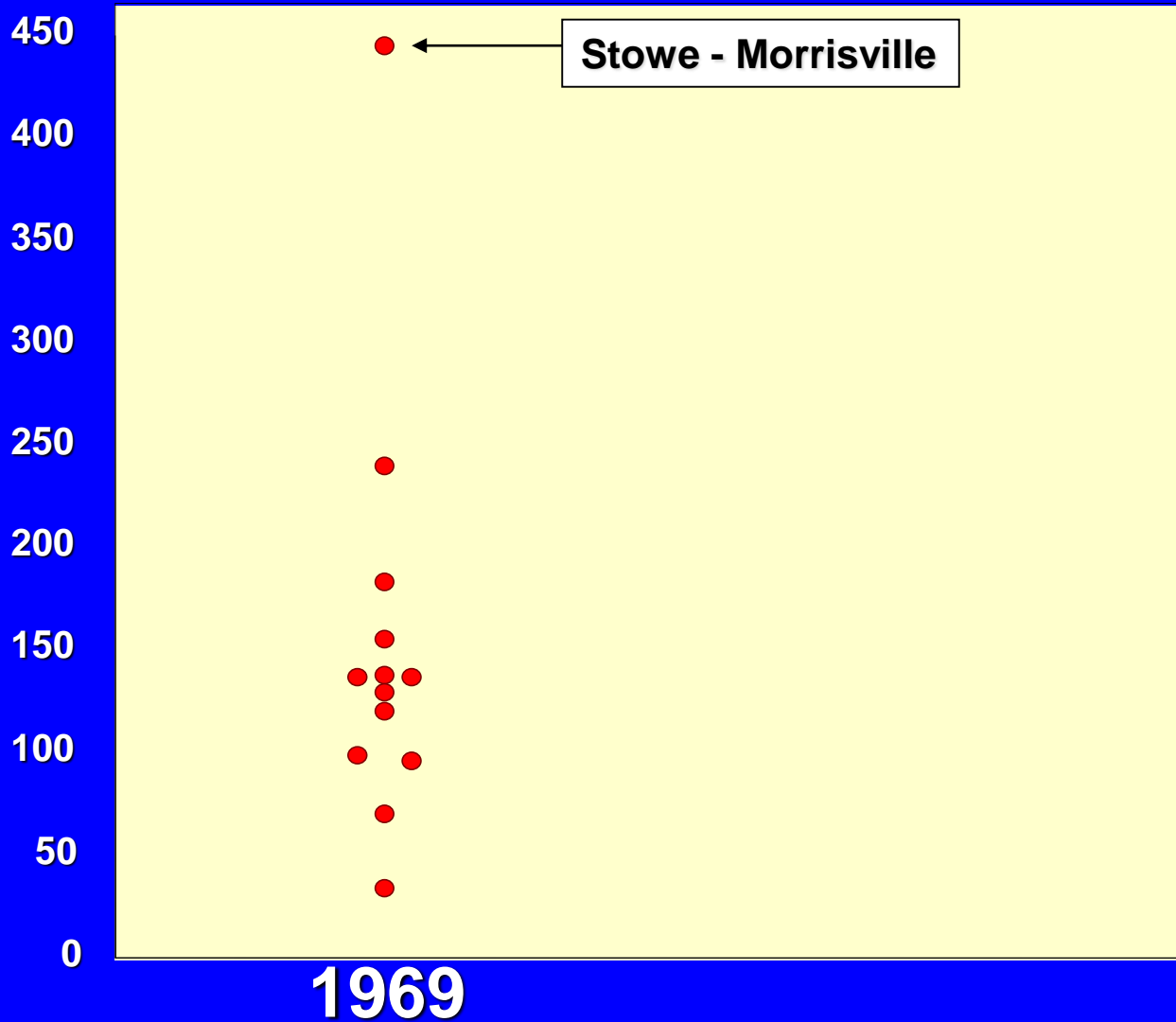
IN 1969, there were 1.27 neurosurgeons per 100,000, very close to the US average. If hospitals of similar size followed, the Vermont rate would rise to more than 2.0. This would diminish referrals to the two regional hospitals, increase costs and hamper training program at both university hospitals serving Vermont.

Promoting Accountability for Reducing Unwarranted Variation

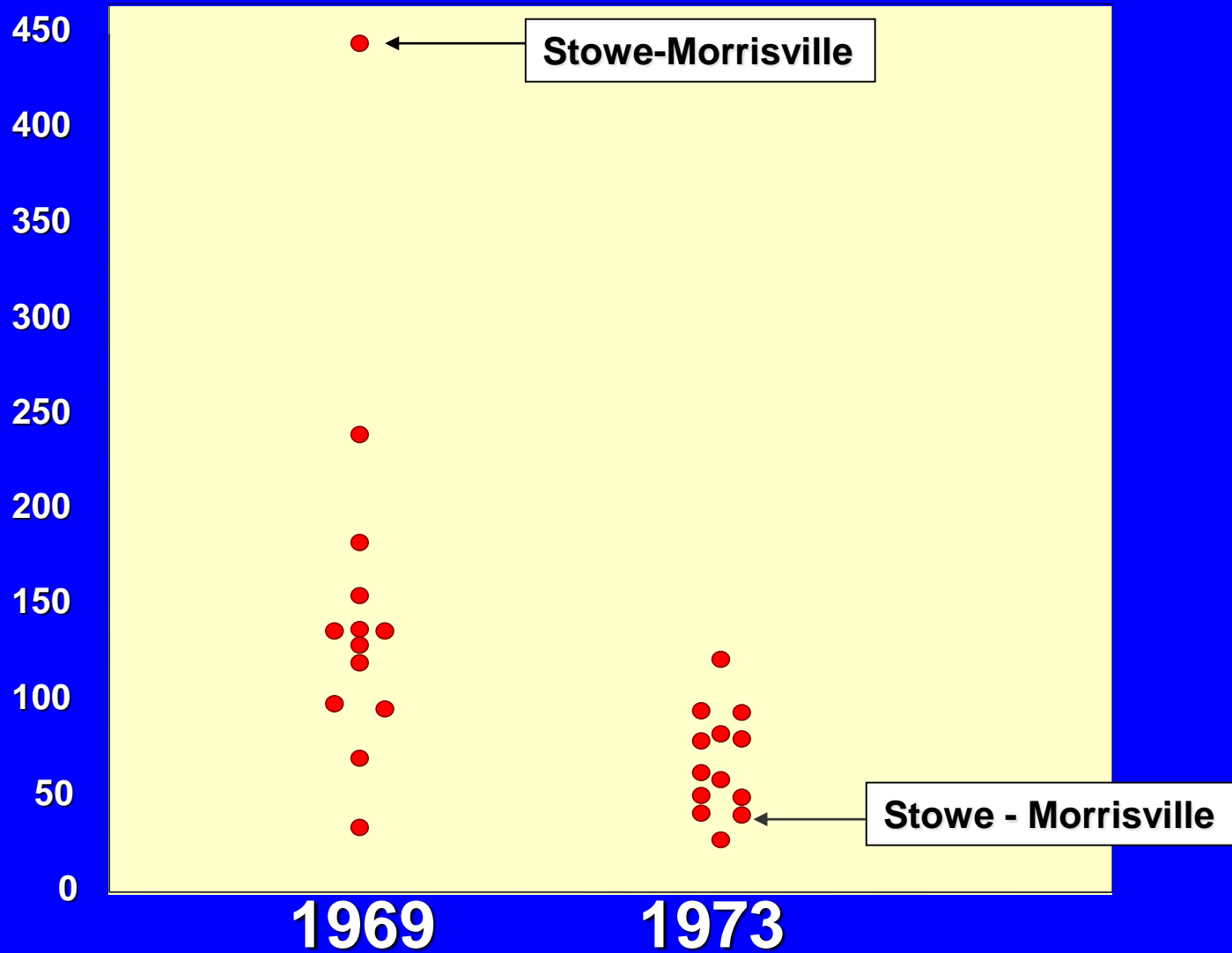
**A story of the response of medical leadership
to feedback on variation in surgical practice**

The Tonsillectomy Story

Tonsillectomies per 10,000 Children among Vermont HSAs



Response of Vermont physicians after feedback by Leaders of the Vermont Medical Society Tonsillectomies per 10,000 Children



Pediatrics

ARTICLES

Changes in Tonsillectomy Rates Associated With Feedback and Review

John E. Wennberg, M.D., Lewis Blowers, M.D., Robert Parker, M.D.,
and Alan M. Gittelsohn, Ph. D.

From Harvard School of Public Health, Boston; Copley Hospital, Morrisville, Vermont; and The Johns Hopkins School of Hygiene, Baltimore

ABSTRACT. Among 13 Vermont Hospital Service Areas, tonsillectomy rates decreased over a five-year period. In 1969, the rates in seven areas exceeded the estimated United States national rate; by 1973, the average rate for all areas had declined 46% and only one area remained above the U.S. rate. Much of the change occurred after feedback of data to the Vermont State Medical Society demonstrating 1969 variations. In 12 of the 13 areas, the relationship between feedback and change in clinical practices could not be

receives the majority of their care from one or two local hospitals. In 1969, there was a 13-fold difference between the lowest and highest age-adjusted per capita rate of tonsillectomy among the 13 largest Hospital Service Areas. In the area with the highest rate, the 1969 rate implies tonsillectomies in 63% of the resident population

Promoting Accountability for learning what works and what patients want

**A story of the response of medical leadership
to feedback on variation in surgical practice**

Health Care Delivery in Maine I: Patterns of Use of Common Surgical Procedures

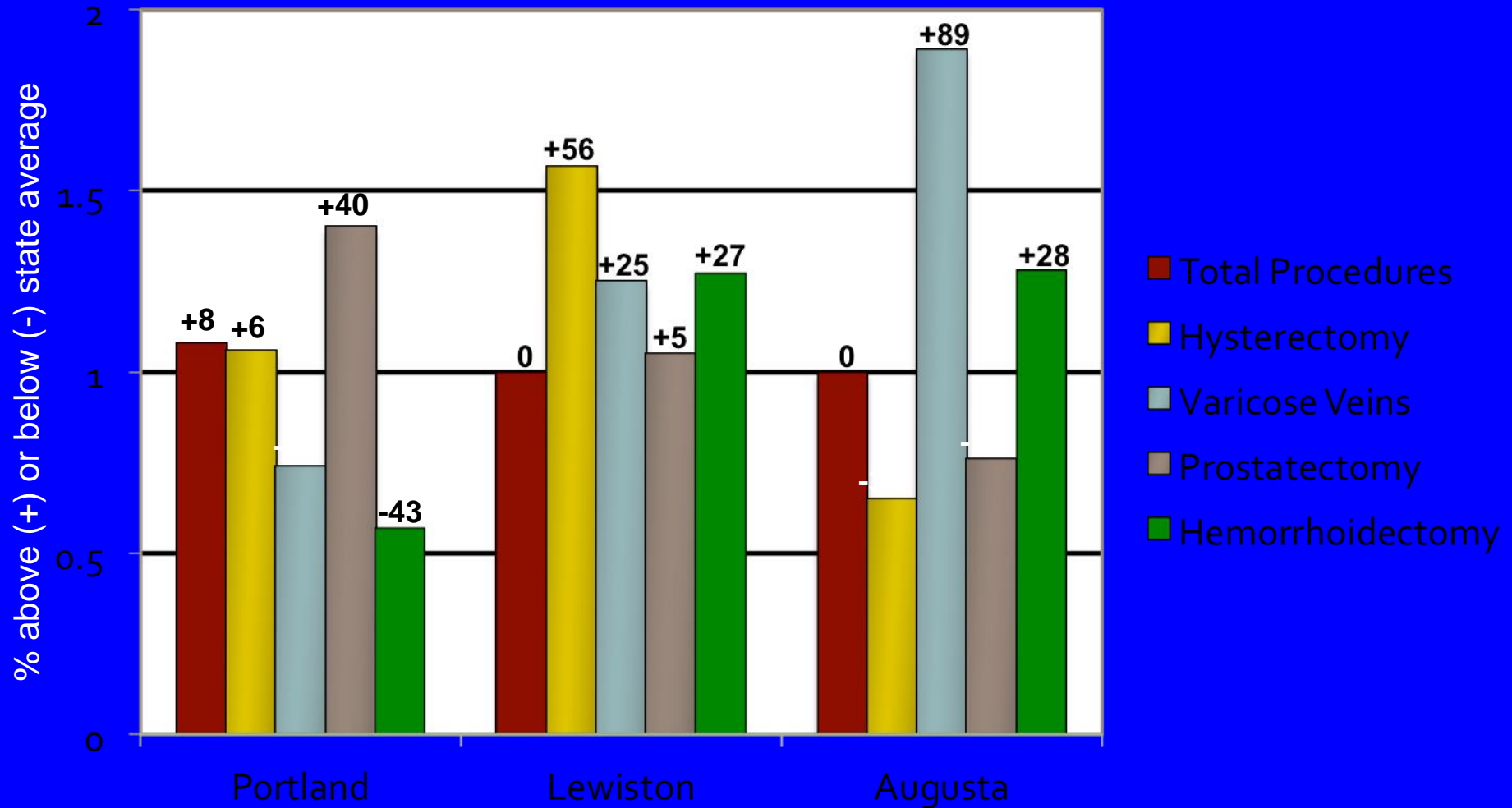
JOHN E. WENBERG, M.D.* and ALAN GITTELSON, Ph.D.**

We report herein patterns of use of surgical procedures among geographically distinct Hospital Service Areas in the State of Maine. Our purpose is to measure differences in the use of surgical procedures throughout the State and to discuss possible causes and implications. The data are presented as age-adjusted incidence rates by area for all surgical discharges and for the nine common surgical procedures: tonsillectomy, hysterectomy, dilation and

State is organized administratively into over 500 towns which average about 36 miles in area. Geographic areas for study were defined by assigning each of Maine's 500 towns to a unique Hospital Service Area (HSA). A simple procedure was followed: Patient records were classified initially by town and hospital and towns were then assigned to the hospital used by the plurality of residents. To avoid possible confusion between mailing address

respond to feedback??

The surgical signatures of three Maine HSAs



Adapted from Journal of the Maine Medical Association, May 1975

Prostatectomy for BPH: Preventive vs. Quality of Life Theory

- ▶ Surgery prevents kidney damage and improves life expectancy.

versus

- ▶ Surgery is done to improve the quality of life by reducing symptoms.

Watchful Waiting vs Immediate Transurethral Resection for Symptomatic Prostatism

The Importance of Patients' Preferences

Michael J. Barry, MD; Albert G. Mulley, Jr, MD, MPP; Floyd J. Fowler, PhD; John W. Wennberg, MD

The rate of resection for benign prostatic hypertrophy shows considerable variability among small geographic areas. To help inform the decision to recommend prostatectomy to men with prostatism without signs of chronic retention, we performed a decision analysis to compare the expected outcomes with immediate transurethral resection and watchful waiting. Data used in the model originated from the medical literature, Medicare claims data, and patient interview studies. In our base-case analysis for 70-year-old men, immediate surgery resulted in the loss of 1.01 months of life expectancy, but when adjustments were made for quality of life, immediate surgery was favored with a net utility benefit of 2.94 quality-adjusted life-months. However, the analysis was particularly sensitive to the degree of disutility attributed to the index symptoms of prostatism. We conclude that patient preferences should be the dominant factor in the decision whether to recommend prostatectomy.

(*JAMA* 1988;259:3010-3017)

WIDESPREAD variations in rates of surgical procedures among geographical areas have been interpreted as evidence for professional uncertainty concerning indications for these procedures.¹ Prostatectomy is one of the more common procedures for which such variation has been documented.^{2,3}

Prostatectomy is performed both to

prevent future morbidity and mortality and to reduce symptoms. Review of the literature and discussion with practicing urologists participating in the Maine Medical Assessment Program indicate little professional disagreement on the need to operate on patients with chronic urinary retention and large residual volumes or evidence of hydroureter or hydronephrosis, which poses a threat of urosepsis or renal failure. There is, however, considerable disagreement with the theory that prostatectomy extends life expectancy among patients without chronic retention by averting potentially fatal complications of prostate disease or by avoiding the need for surgery when the patient is older and at

higher operative risk. This controversy has important implications for understanding and dealing with geographic variations in medical practice. If the only function of prostatectomy were to prevent outcomes such as urosepsis, renal failure, or death, which everyone agrees are necessary to avoid, a single "right" threshold for recommending prostatectomy might be based on clinical or urodynamic predictors of these complications. However, when the primary purpose of prostatectomy is to re-

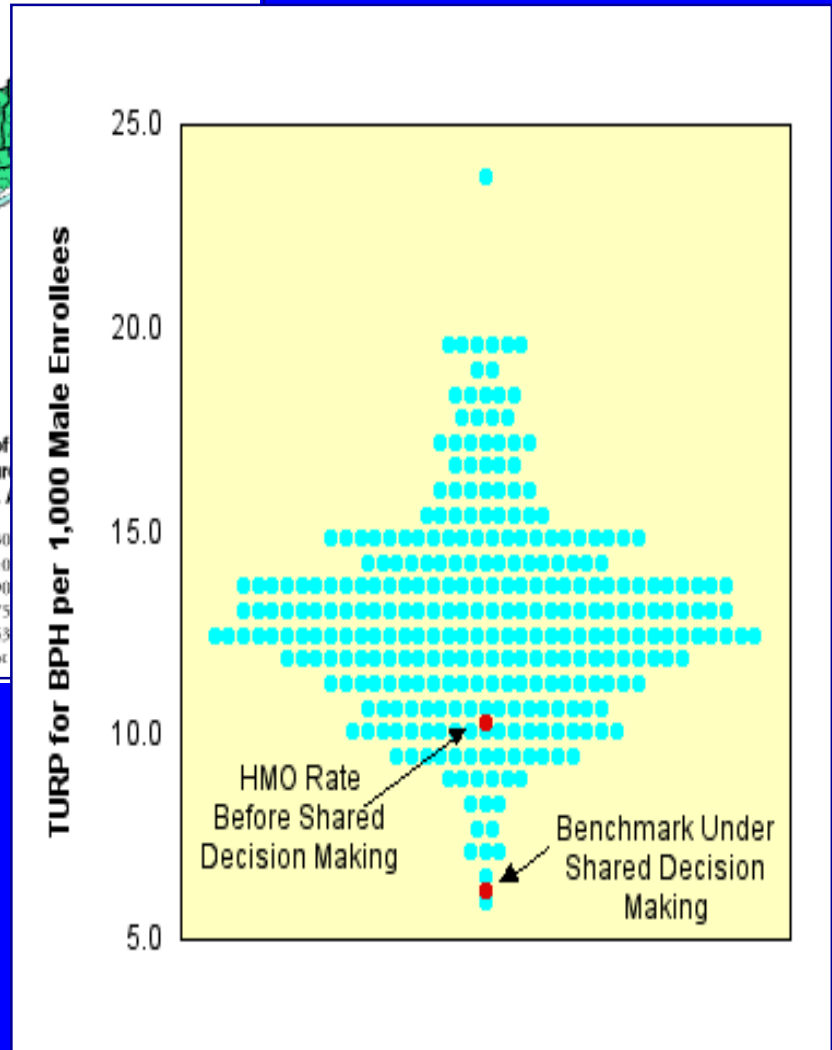
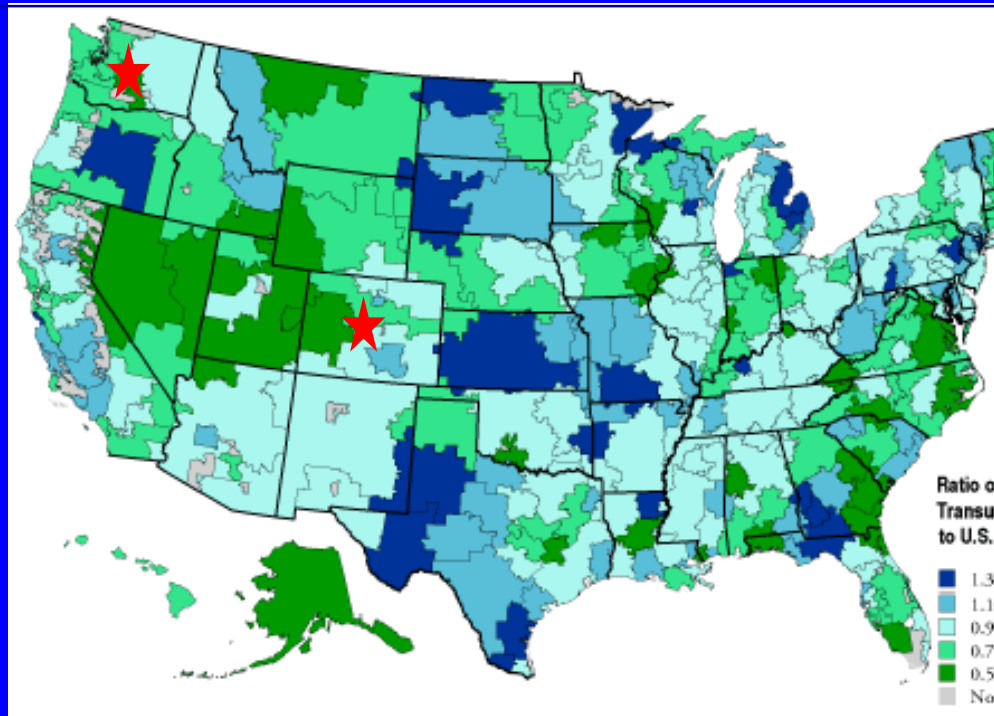
See also pp 3018 and 3027.

lieve symptoms and improve the quality of life, the decision to operate should depend heavily on the particular patient's relative preferences for different outcomes, including various levels of urologic symptoms and potential operative and nonoperative complications. Indications for prostatectomy cannot, therefore, be simply defined as appropriate or not; a "right" rate for prostatectomy in a community cannot be established without examining the individual decisions that contribute to the rate. We developed a decision-analysis model to understand more fully the preventive and quality-of-life indications for prostatectomy and to define the most important probabilities and utili-

From the General Internal Medicine Unit, Massachusetts General Hospital, and Harvard Medical School (Drs Barry and Mulley) and The Center for Survey Research, University of Massachusetts (Dr Fowler), Boston; and Dartmouth Medical School, Hanover, NH (Dr Wennberg). Dr Mulley is a Henry J. Kaiser Family Foundation Faculty Scholar in General Internal Medicine.

Reprint requests to the General Internal Medicine Unit, Massachusetts General Hospital, Bulfinch 1, Fruit St, Boston, MA 02114 (Dr Barry).

Which Rate is Right? Impact of Improved Decision Quality on Surgery Rates in Group Health and Kaiser Denver: BPH



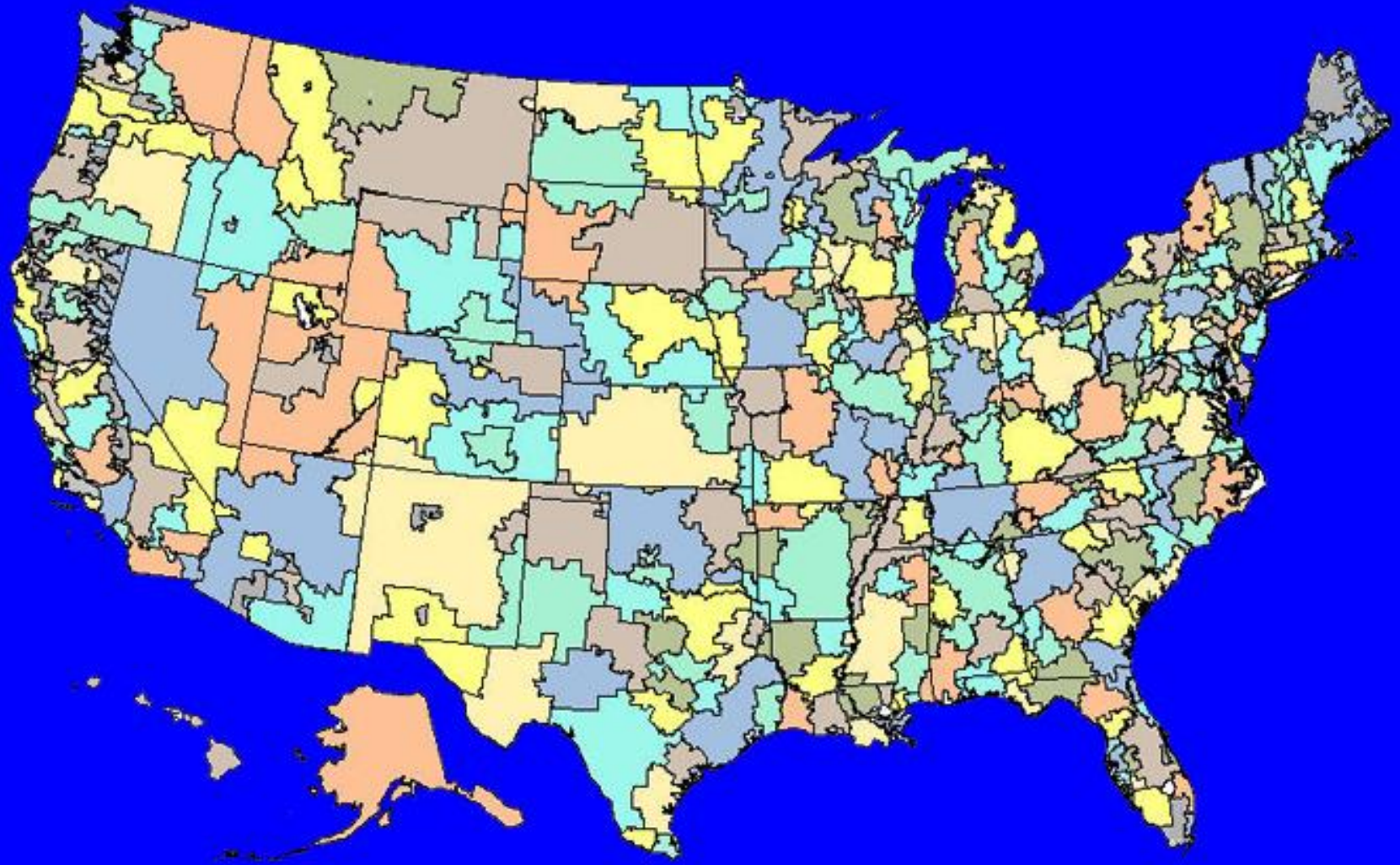
Knowledge of relevant treatment options and outcomes

Concordance between patient values and care received

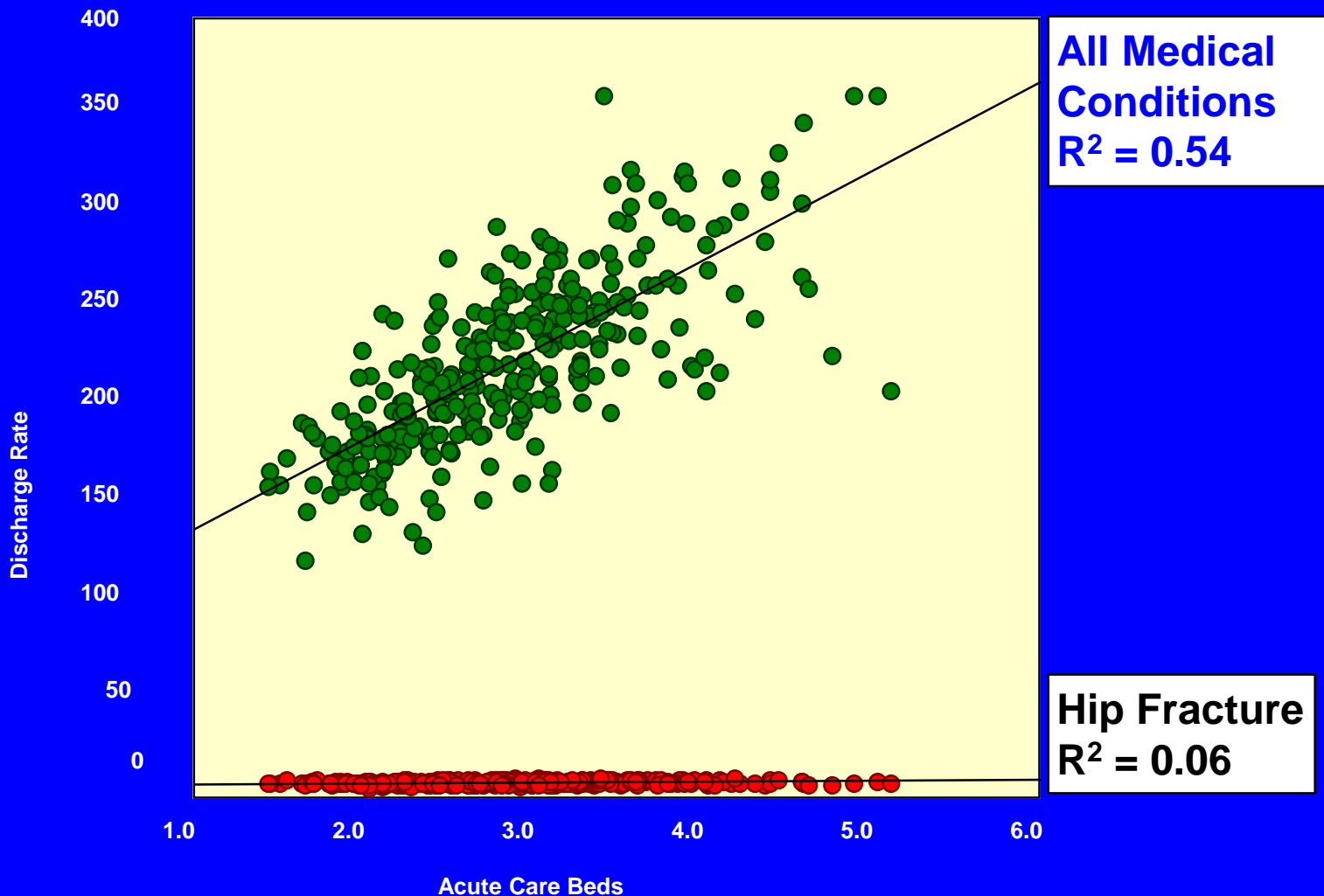
Promoting Accountability for managing chronic diseases over the course of illness

An unfinished story of unwarranted variation in the intensity of inpatient care: Using population-based data to make the problem visible

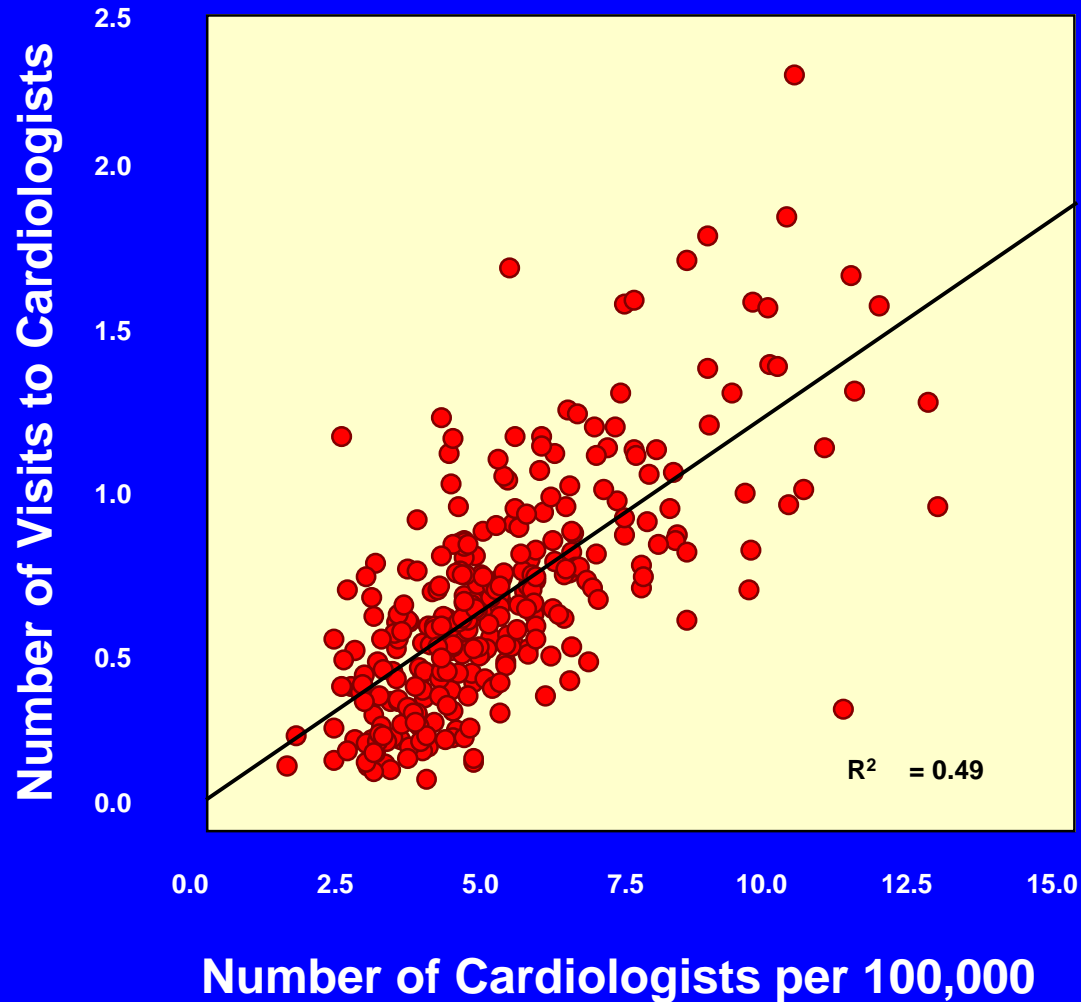
The Dartmouth Atlas Project: Hospital Referral Regions



Association Between Hospital Beds per 1,000 and Discharges per 1,000 Among Medicare Enrollees: 306 Hospital Regions



Association Between Cardiologists and Visits per Person to Cardiologists Among Medicare Enrollees: 306 Regions



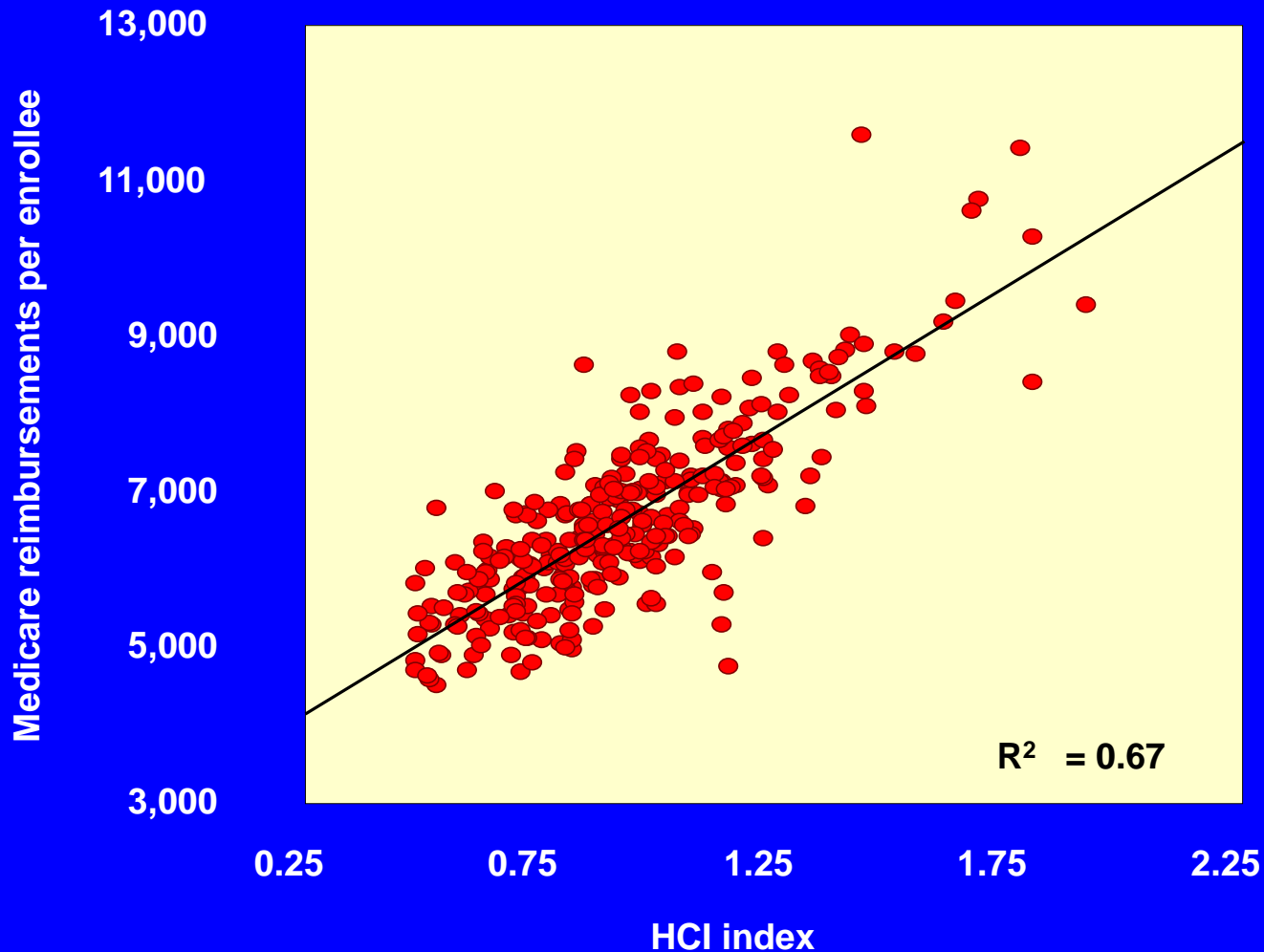
The Hospital Care Intensity Index

The HCI index =

**inpatient visits + inpatient days per capita
(standardized to the national average)**

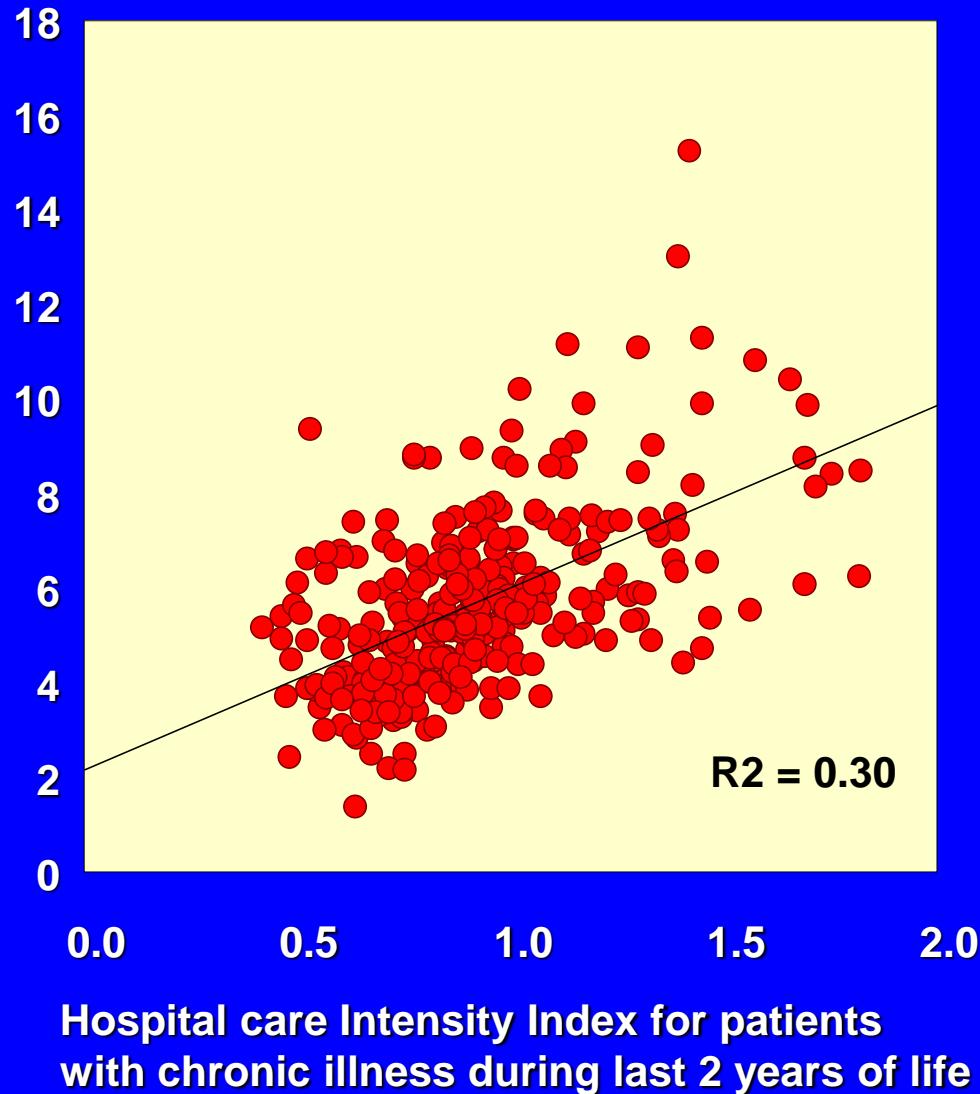
Measured for patients with chronic illness

Greater intensity of inpatient care in managing chronic illness is associated with greater overall spending

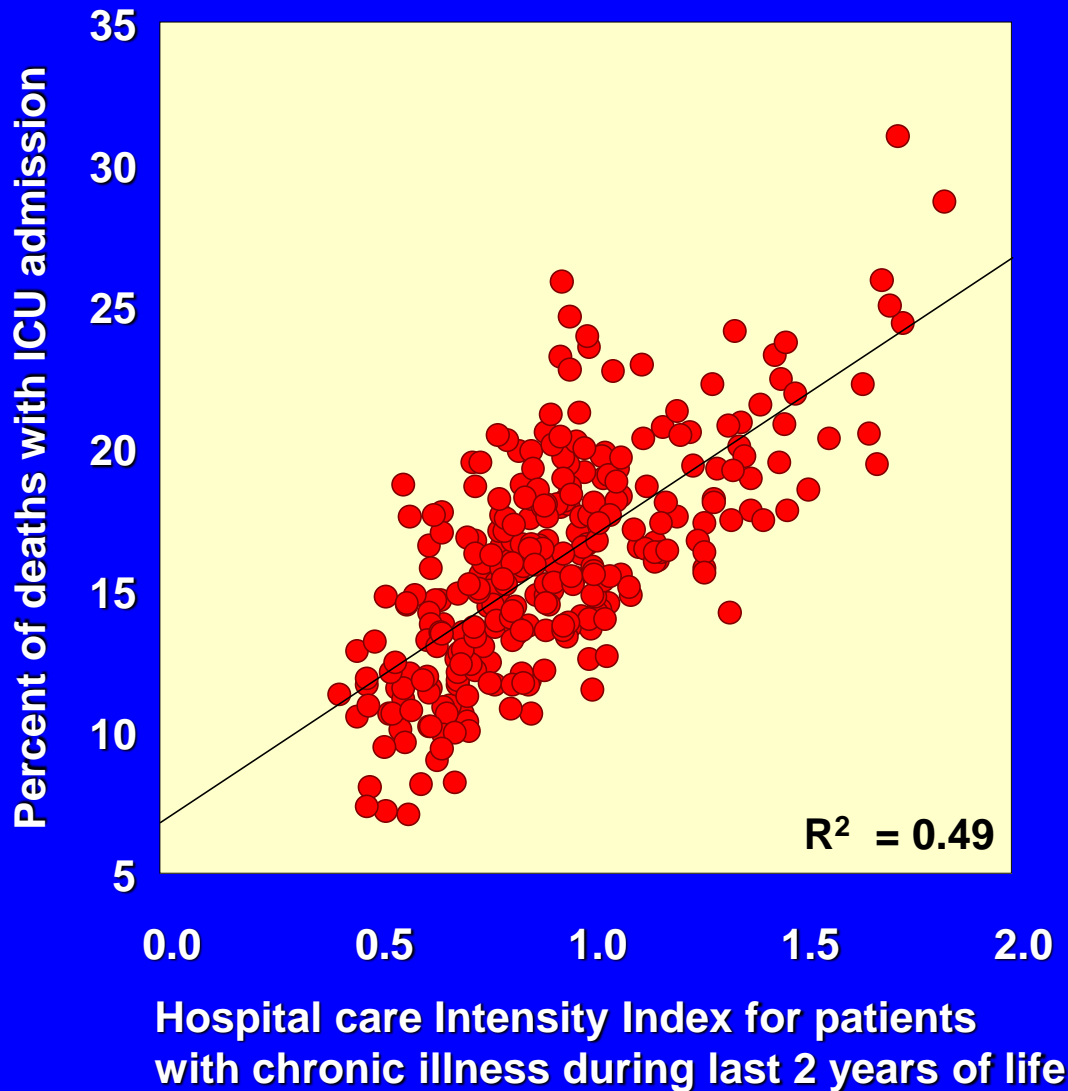


Hospitalized patients in regions with high intensity inpatient care rank their hospitals less favorably

Percent of patients that would not recommend their Hospital to friends or family

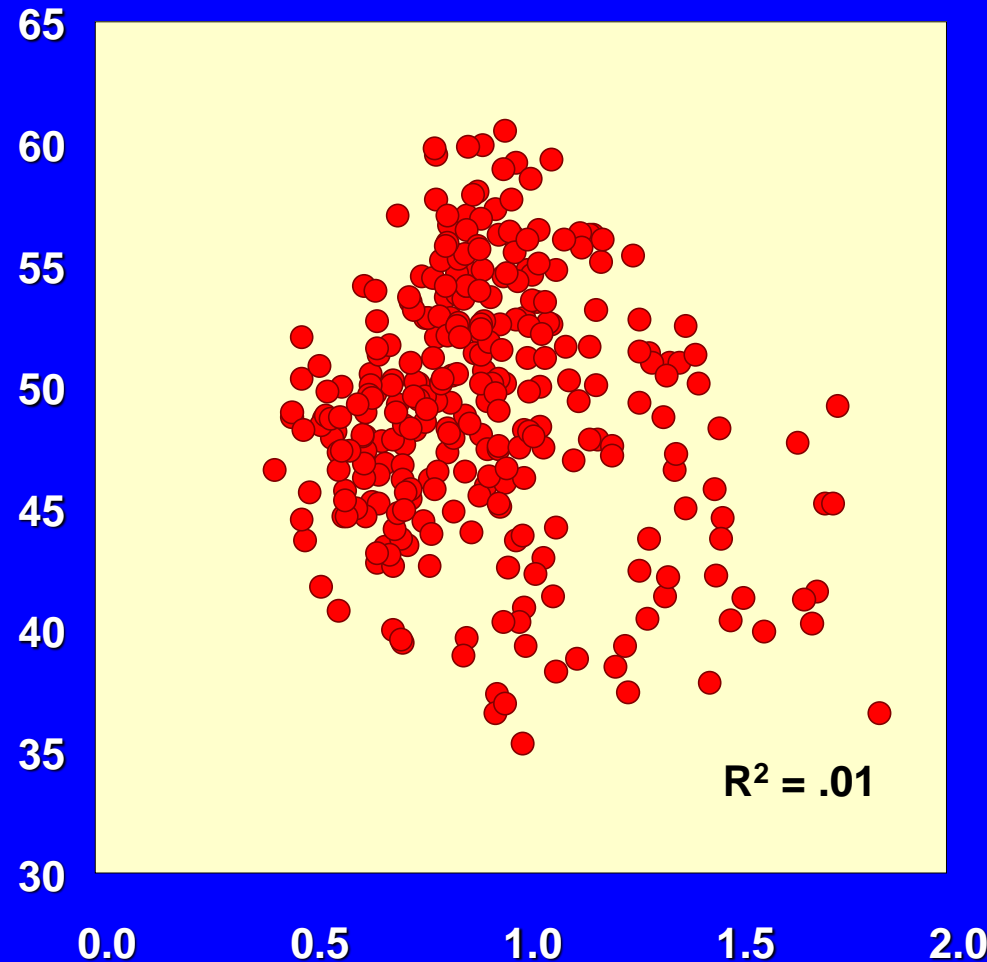


Patients living in regions with greater hospital care intensity are more likely to die in an ICUI



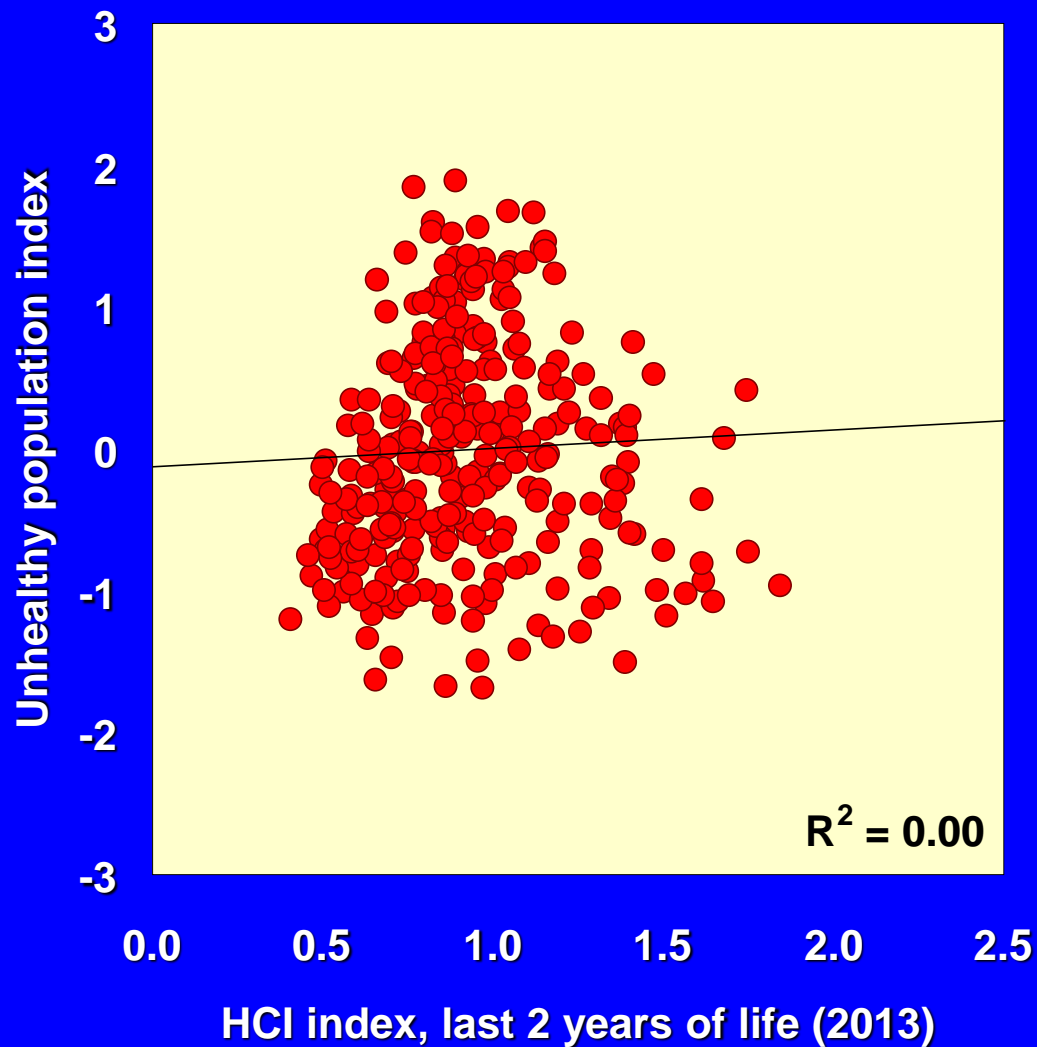
Intensity of inpatient care for those with chronic illness has no association with all-cause mortality per 1,000

Medicare mortality per 1000 among hospital referral regions in 2010



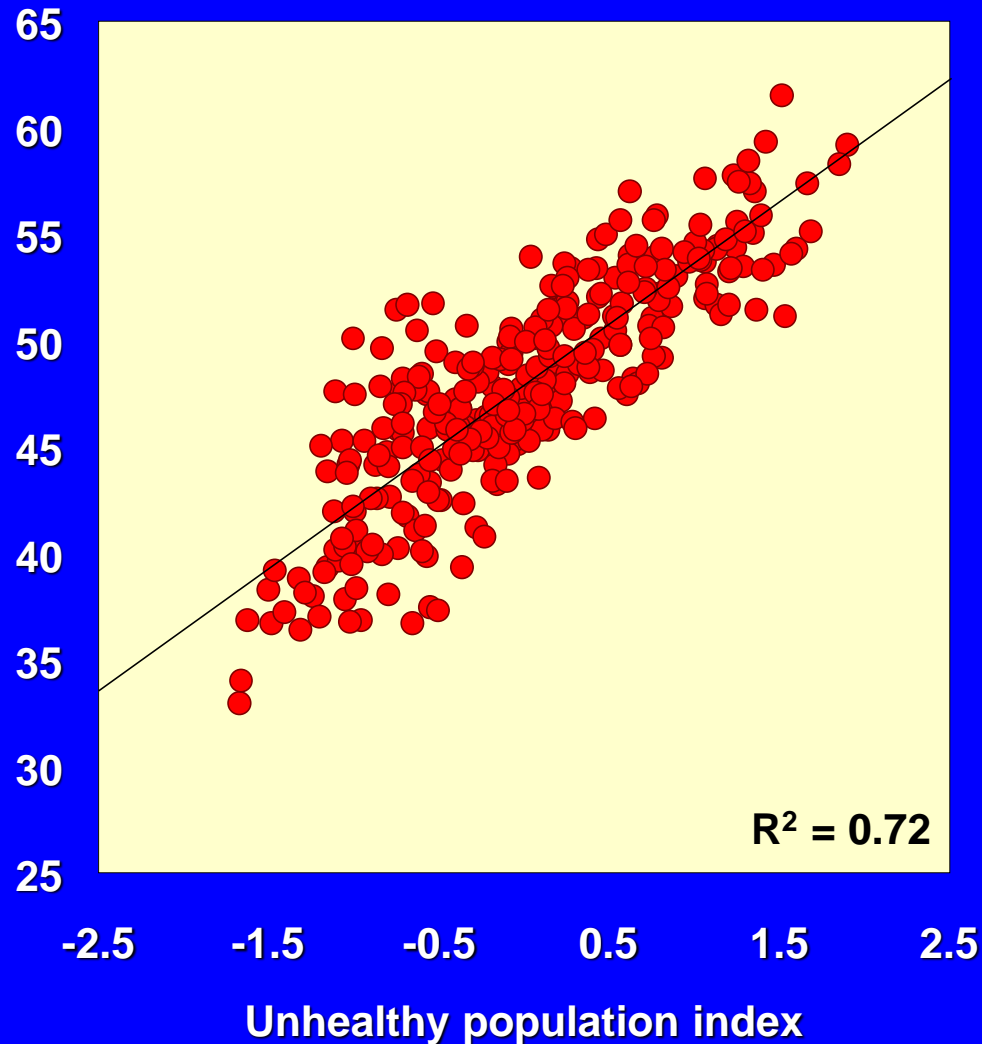
Inpatient hospital care intensity index for patients with chronic illness during last 2 years of life

There is no association between intensity of inpatient care and behavioral risk factors for chronic disease (smoking, poor diet, sedentary)



Behavioral risk factors (smoking, poor diet, low activity) are strongly associated with Medicare mortality

Medicare mortality per 1,000 among hospital referral regions in 2012



Monitoring performance using population-based data: Contemporary examples from Maine and Vermont

- **Maine Medical Center's use of all-payer claims data, CDC's BRFSS data and vital records**
- **Dartmouth Atlas hospital-specific and hospital service area reports**
- **Potential uses of population-based (all-payer) data in establishing accountability for the capacity/budget of the health care system**

Monitoring performance using population-based data: Examples from Maine and Vermont

- **Maine Medical Center's model report using all-payer claims data, CDC's BRFSS data and vital records**

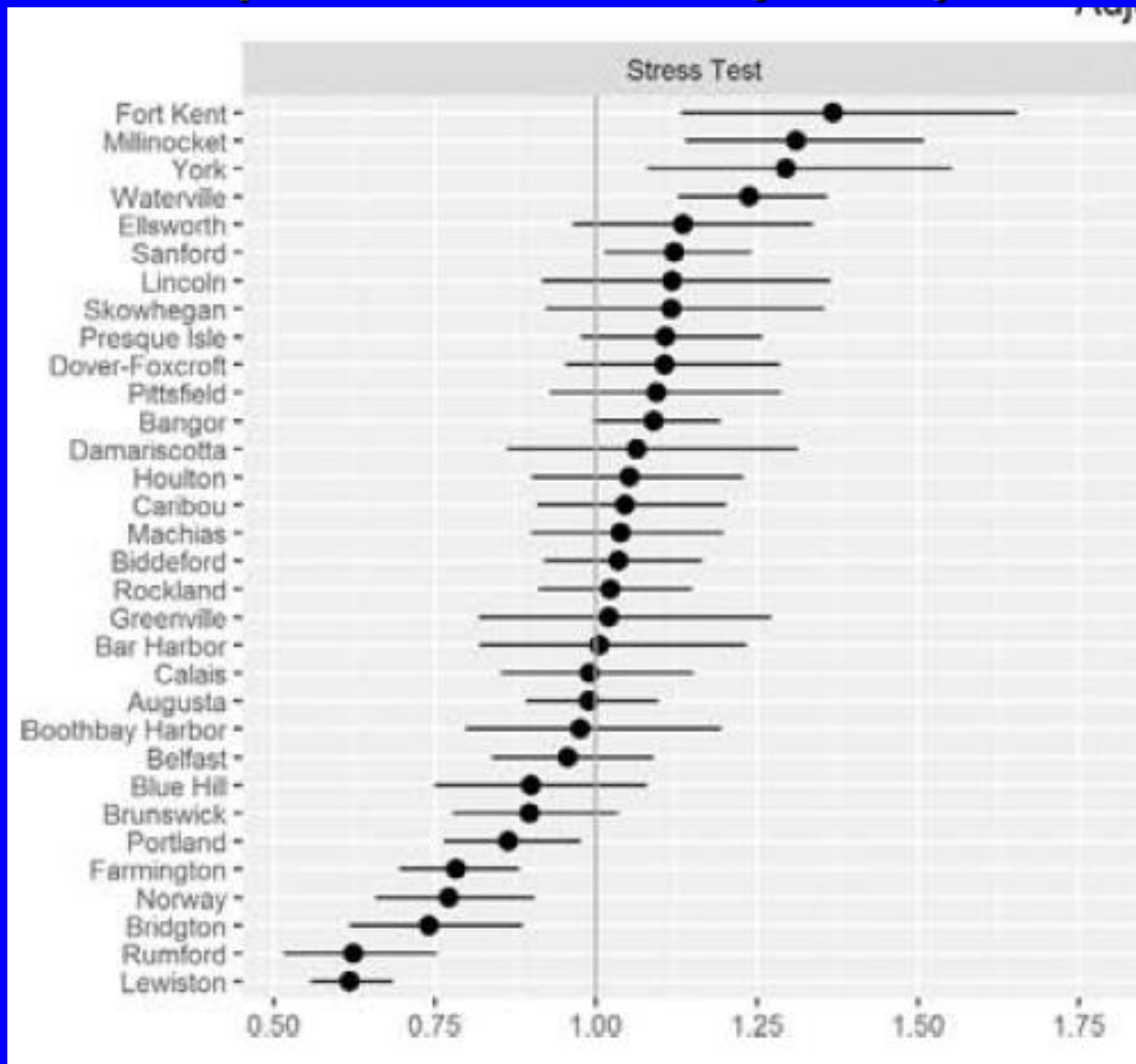
American Journal of
Preventive Medicine

RESEARCH ARTICLE

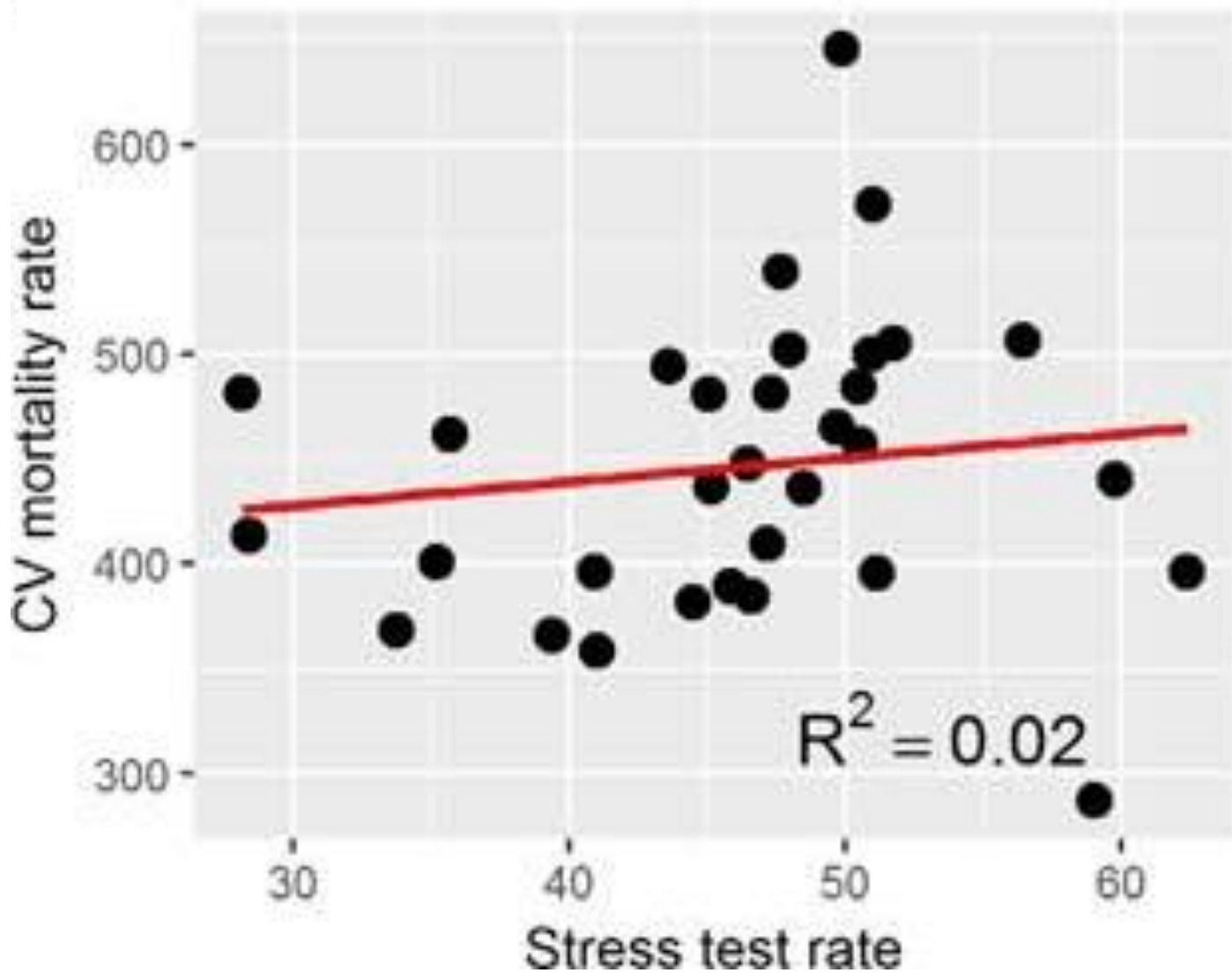
Behavioral Risk Factors and Regional Variation in
Cardiovascular Health Care and Death

Kathleen M. Fairfield, MD, MPH, DrPH,¹ Adam W. Black, BA,¹ F. Lee Lucas, PhD,¹
Andrea E. Siewers, MPH,¹ Mylan C. Cohen, MD, MPH,² Christopher T. Healey, MD,³
Allison C. Briggs, BA,⁴ Paul K.J. Han, MD, MA, MPH,¹ John E. Wennberg, MD, MPH⁵

Example for Maine from Fairfield et al. (AJPM, 2018, in press)

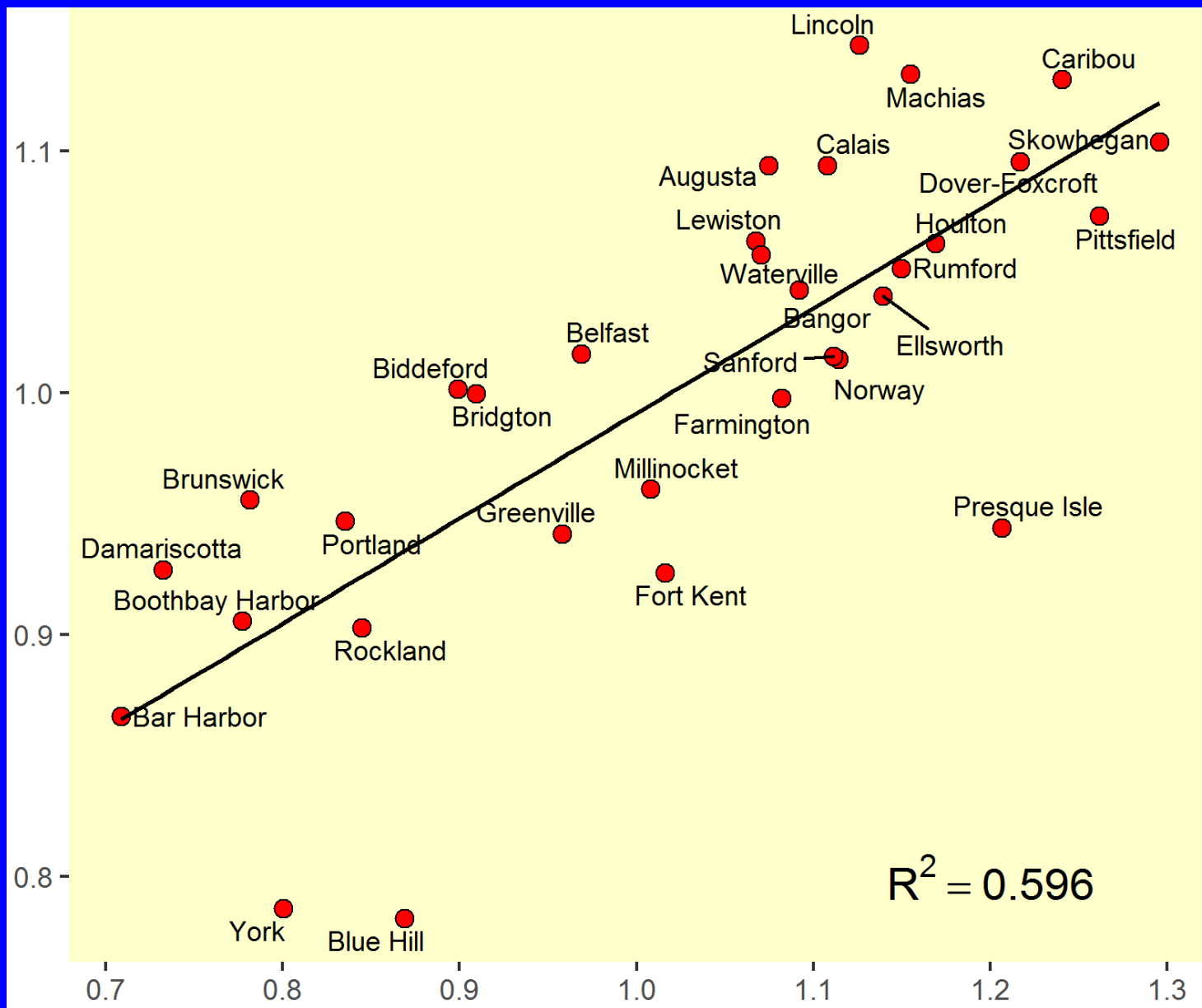


Fairfield et al / Am J Prev Med 2018;1(1):111-111



Mortality – Health Behaviors in Maine HSAs

All cause mortality (age 35+, SMR, 2010-14)

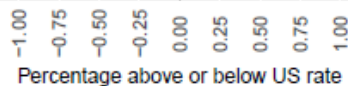


Mean % of smokers, poor diet, and inactive (std, 2010-14)

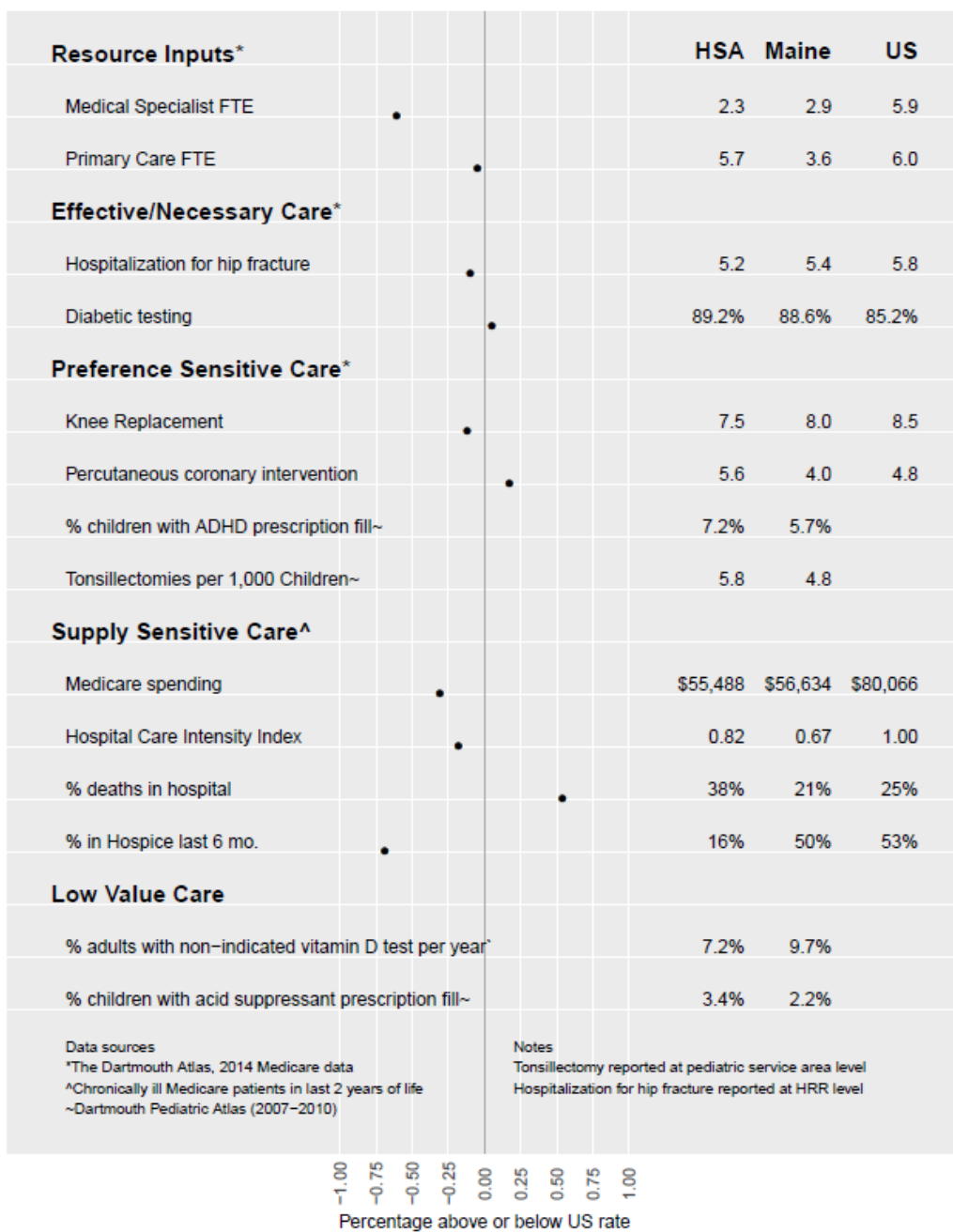
Representative HSA Population Health report

| Demographics* | HSA | Maine | US |
|---------------------------------------|--------|--------|--------|
| Age - % 65 or older | 22.1% | 21.8% | 19.7% |
| Sex - % Female | 53.0% | 51.8% | 51.3% |
| Education - did not graduate HS | 17.0% | 9.8% | 14.4% |
| Household income under 15K/yr | 19.5% | 11.9% | 11.6% |
| Behavioral Risk Factors* | | | |
| Current Smoking | 27.1% | 20.6% | 16.7% |
| Obesity | 34.1% | 28.5% | 28.9% |
| Low Physical Activity | 33.0% | 26.5% | 28.6% |
| Self-reported medical history* | | | |
| Diabetes | 14.9% | 9.6% | 10.5% |
| COPD | 12.1% | 7.7% | 6.3% |
| Hypertension | 38.2% | 33.0% | 32.0% |
| Myocardial Infarction | 9.8% | 5.4% | 4.3% |
| Stroke | 3.4% | 2.8% | 3.0% |
| Poor/Fair General Health | 21.9% | 15.5% | 17.7% |
| Access to care* | | | |
| Uninsured | 15.0% | 12.0% | 12.2% |
| No doctor | 15.1% | 12.0% | 21.4% |
| Medical cost prevented care | 10.5% | 10.8% | 13.3% |
| Mortality* | | | |
| All cause mortality | 1469.7 | 1385.5 | 1364.6 |
| Cardiovascular mortality | 340.9 | 288.4 | 329.9 |
| Cancer mortality | 347.7 | 341.6 | 318.5 |

Data sources
 *Maine BRFSS (2011-2014)
 *US rates from national BRFSS (2015)
 *CDC Wonder (Aroostook County, age 35+, 2011-2014, age adj. rate per 100,000)



Representative HSA Health Care Delivery report



Data sources

*The Dartmouth Atlas, 2014 Medicare data
 ^Chronically ill Medicare patients in last 2 years of life
 ~Dartmouth Pediatric Atlas (2007-2010)

Notes

Tonsillectomy reported at pediatric service area level
 Hospitalization for hip fracture reported at HRR level

Monitoring performance using population-based data: Examples from Maine and Vermont

- **Maine Medical Center's model report using all-payer claims data, CDC's BRFSS data and vital records**
- **Dartmouth Atlas reports**

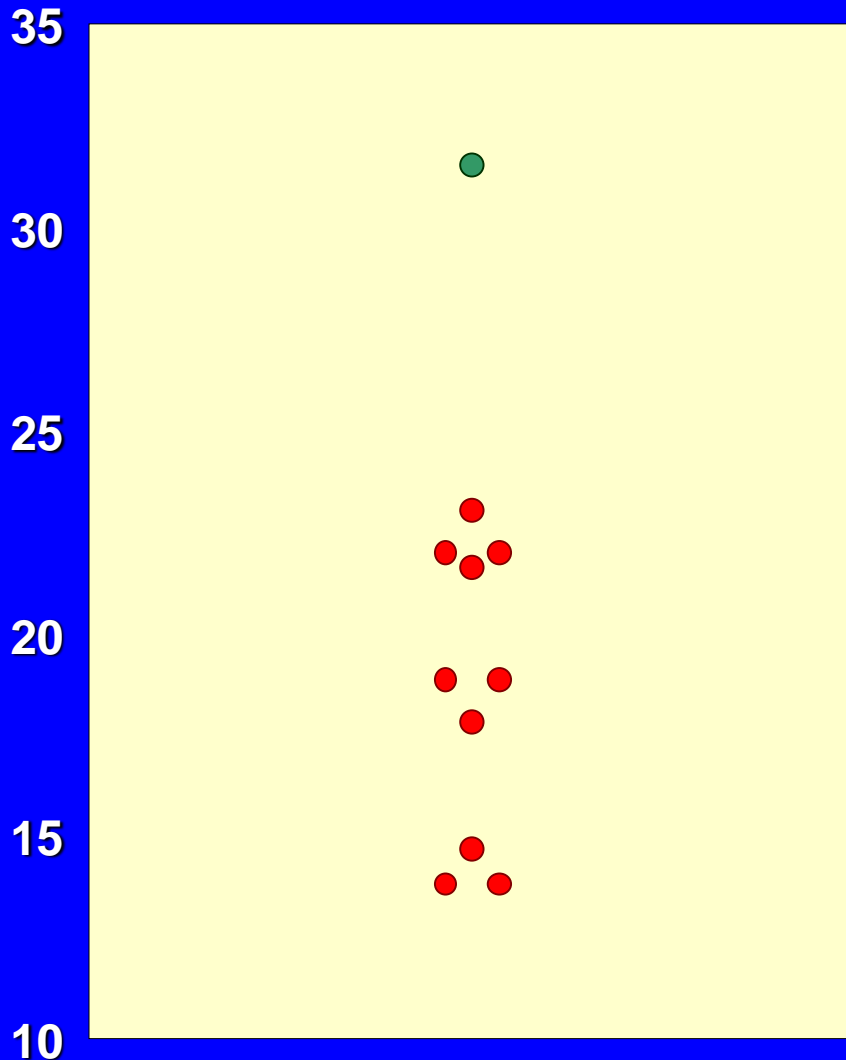
**Example of Dartmouth Atlas surgical report:
knee replacements/per 1000 for traditional Medicare
Vermont hospital service areas (2014)**

| | |
|----------------------|------------|
| Springfield | 9.8 |
| Middlebury | 9.2 |
| St. Albans | 8.1 |
| Randolph | 7.9 |
| Brattleboro | 7.9 |
| Lebanon, NH | 7.2 |
| Rutland | 6.9 |
| St. Johnsbury | 6.1 |
| Burlington | 6.0 |
| Bennington | 5.8 |
| Berlin | 5.5 |
| Morrisville | 5.2 |
| Newport | 5.2 |

**Example of Dartmouth Atlas hospital-specific
resource allocation report:**

**FTE physician labor input in managing
chronic illness over last 2 years**

Total FTE labor input per 1,000 according to Vermont hospital providing most inpatient care (last 2 years of life)



United States average 31.6

Rutland Regional 23.1

University of Vermont 22.1

Southwestern Vermont 22.0

Dartmouth-Hitchcock 21.7

UVM Health Central VT 19.2

Brattleboro Memorial 18.6

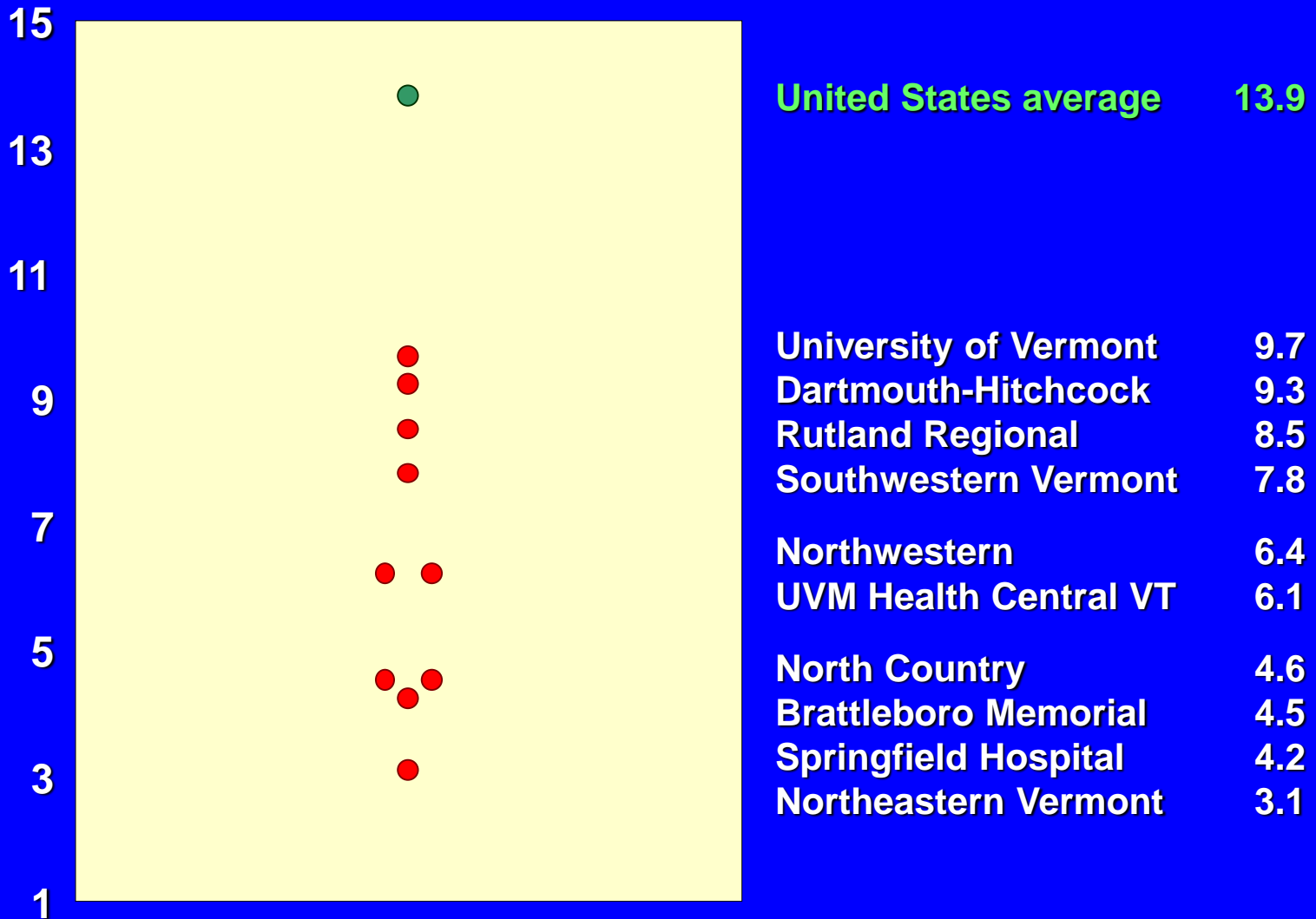
Northwestern 17.8

Springfield Hospital 14.7

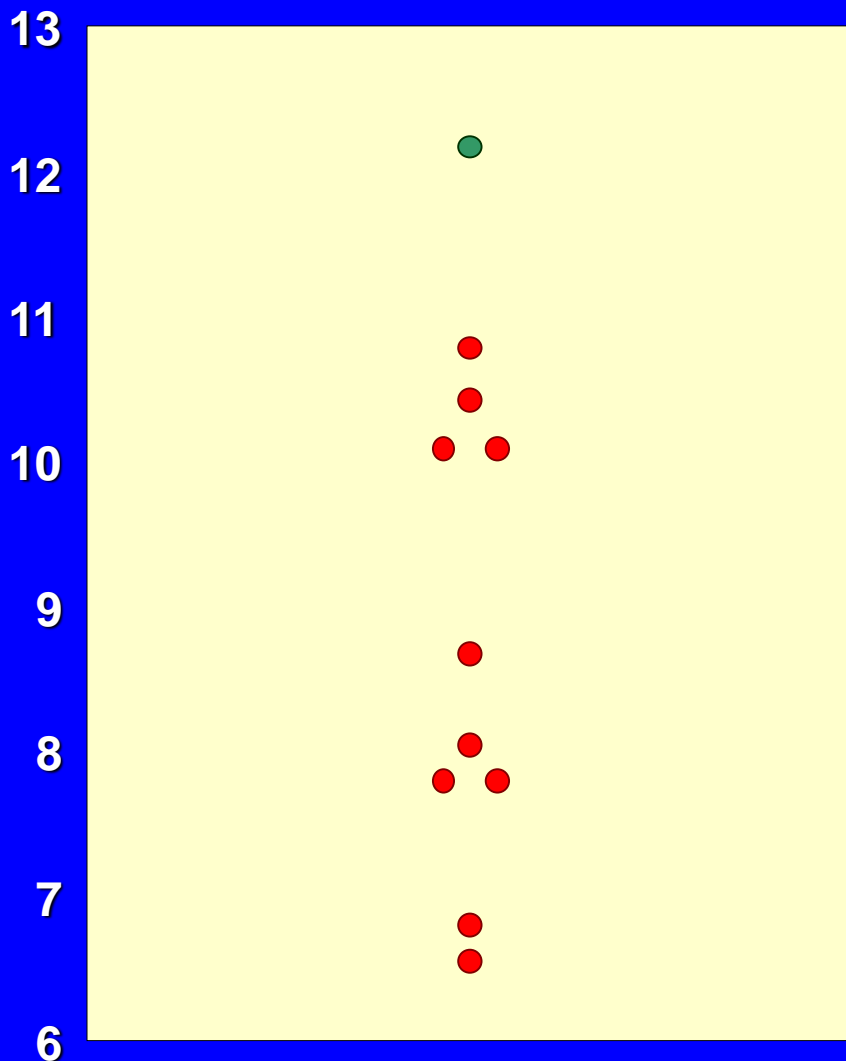
Northeastern Vermont 13.9

North Country 13.8

FTE medical specialist labor input per 1,000 according to Vermont hospital providing most inpatient care (last 2 years of life)



FTE primary care physician labor input per 1,000 according to Vermont hospital providing most inpatient care (last 2 years)



United States average 12.2

Brattleboro Memorial 10.8

Rutland Regional 10.4

Southwestern Vermont 10.1

UVM Health Central VT 10.1

Northwestern 8.7

University of Vermont 8.0

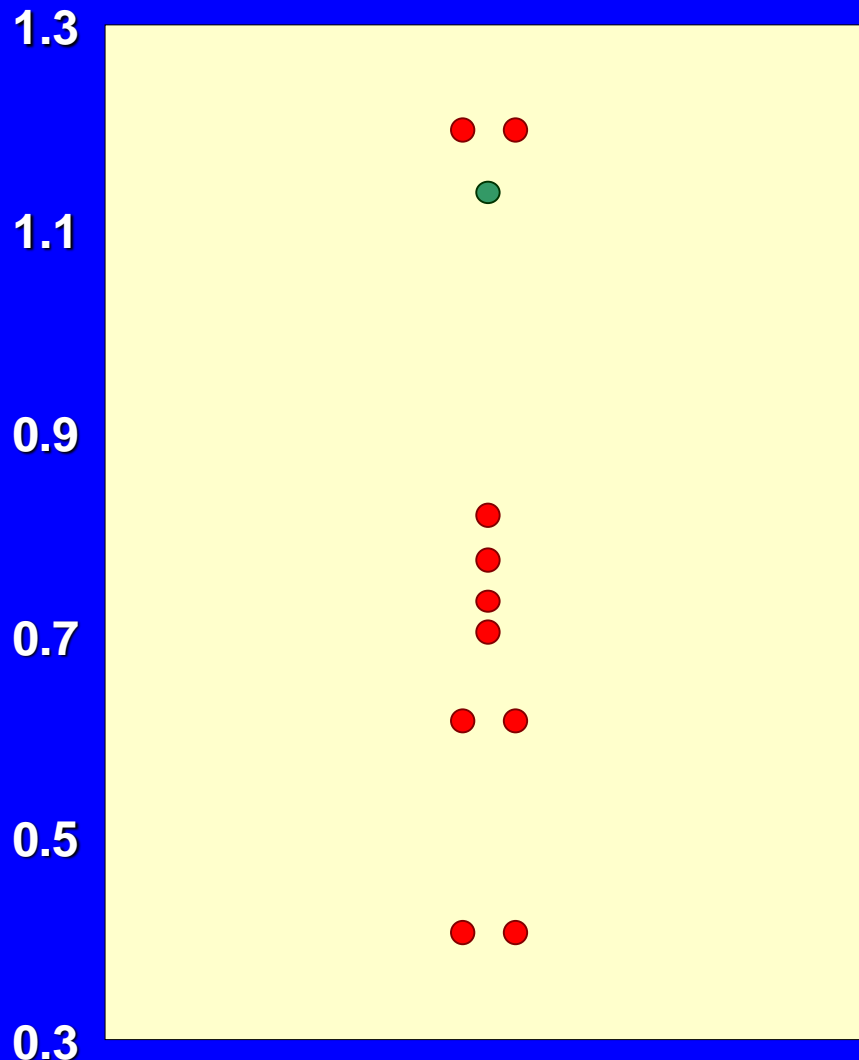
Northeastern Vermont 7.9

Dartmouth-Hitchcock 7.8

Springfield Hospital 6.8

North Country 6.6

Ratio of medical specialist to primary care physician labor inputs during the last two years of life (2014 deaths) by hospital

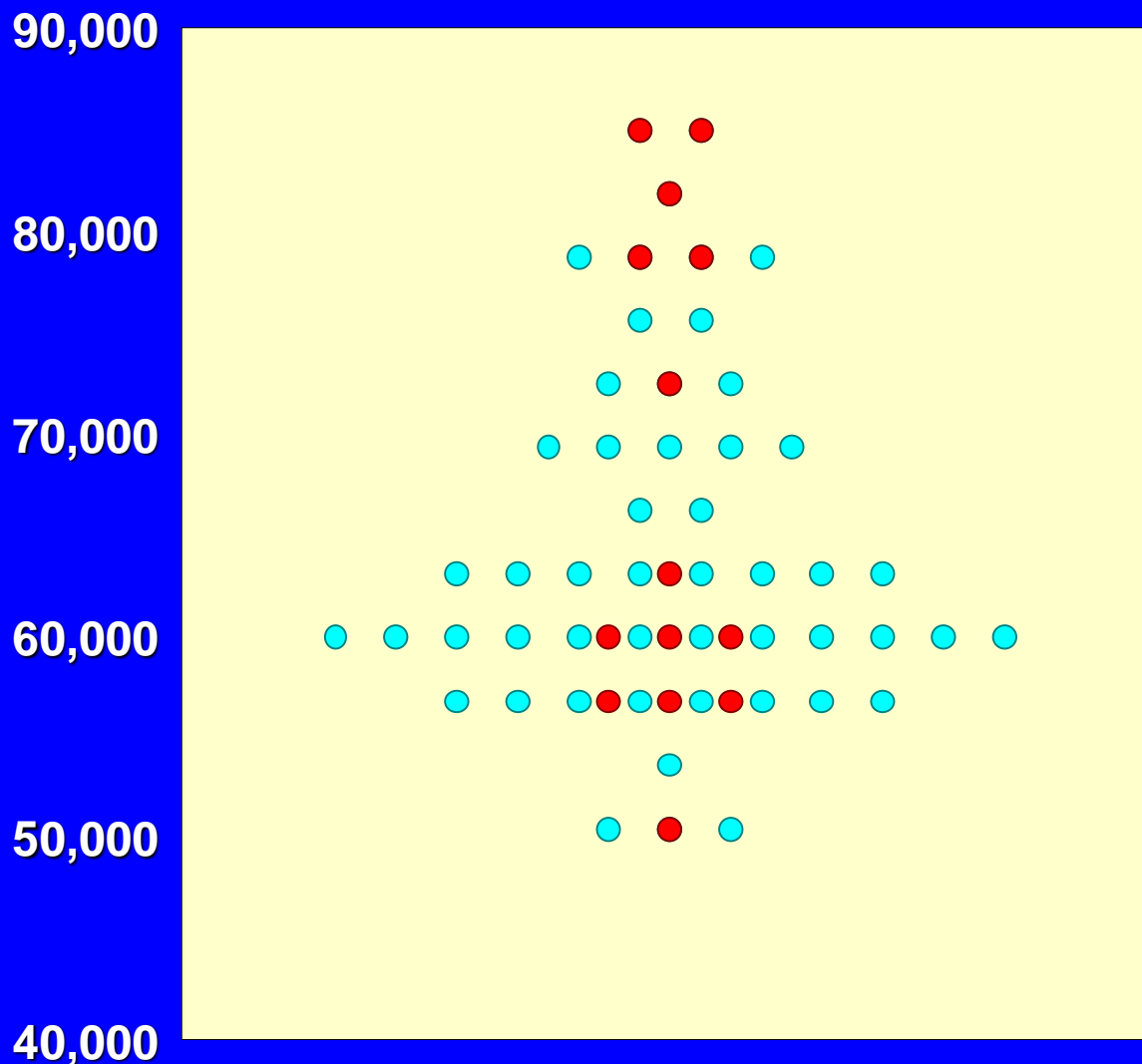


| | |
|-----------------------|------|
| University of Vermont | 1.20 |
| Dartmouth-Hitchcock | 1.19 |
| United States average | 1.14 |
| Rutland Regional | 0.82 |
| Southwestern Vermont | 0.77 |
| Northwestern | 0.73 |
| North Country | 0.70 |
| Springfield Hospital | 0.62 |
| UVM Health Central VT | 0.61 |
| Brattleboro Memorial | 0.42 |
| Northeastern Vermont | 0.40 |

Monitoring performance using population-based data

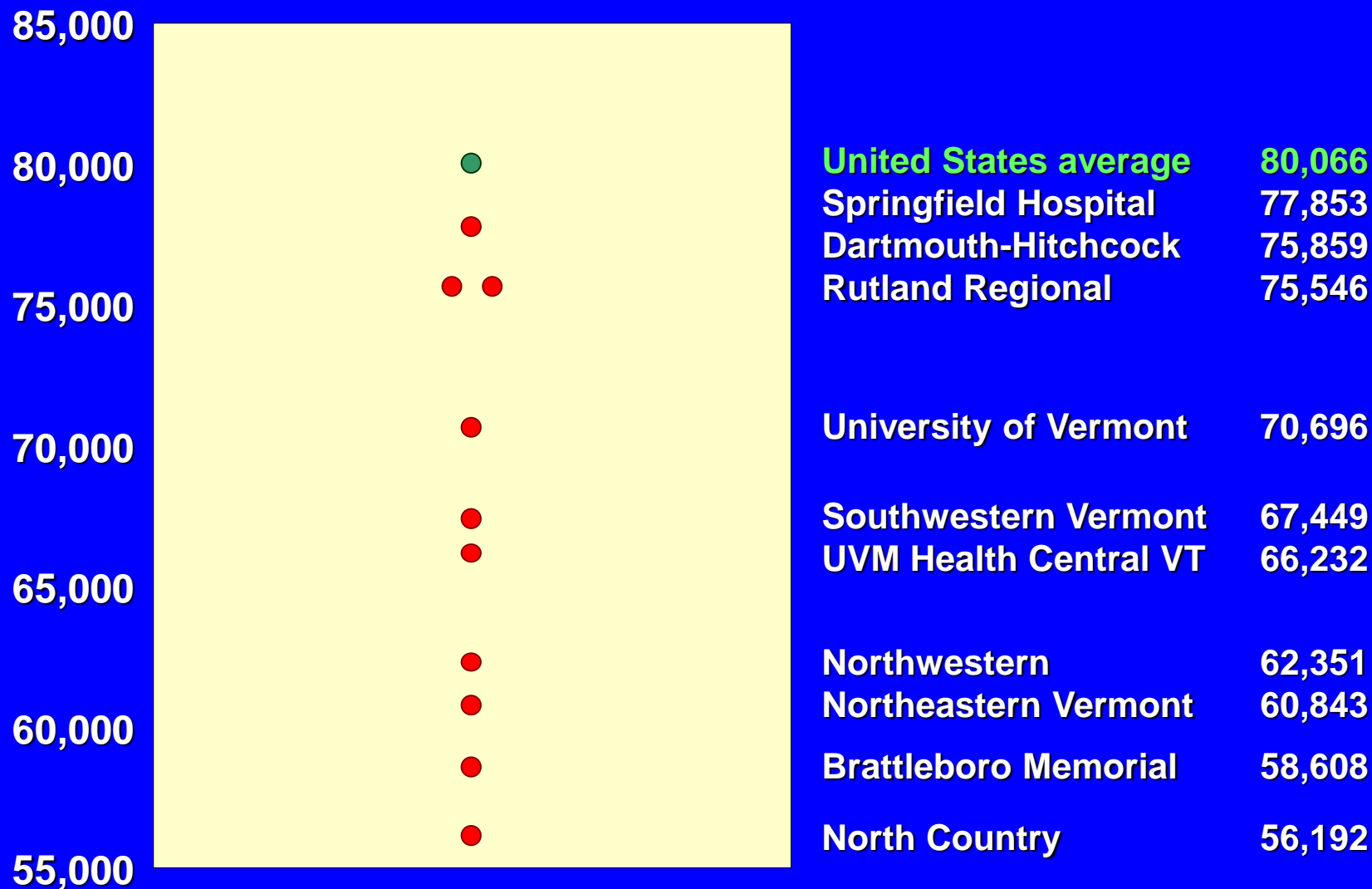
- **Maine Medical Center's model report using all-payer claims data, CDC's BRFSS data and vital records**
- **Dartmouth Atlas reports**
- **Potential uses of population-based (all-payer) data in establishing accountability for the capacity/budget of the health care system**

Total Medicare spending per patient during the last two years of life (2014 deaths) by state



| | |
|-----------------|---------------|
| California | 86,616 |
| New Jersey | 83,996 |
| New York | 80,793 |
| Massachusetts | 79,792 |
| Maryland | 79,283 |
| Illinois | 72,567 |
| New Hampshire | 64,413 |
| Washington | 61,323 |
| Vermont | 59,914 |
| Minnesota | 58,420 |
| Wisconsin | 57,253 |
| Maine | 56,634 |
| Oregon | 55,405 |
| South Dakota | 51,086 |

Total Medicare spending per patient during the last two years of life (2014 deaths) by hospital



Pathways to Reform

- **Replace disorganized, chaotic “systems” with organized systems**
- **Establish shared decision making and informed patient choice**
- **Improve the science of health care delivery**
- **Establishing accountability for the capacity of the health care system relative to the size of the population served**
- **Monitor performance using population-based data with feedback to providers, policy makers, patients and general public:**